

**UNOCAL**  
P.O. BOX 661  
San Luis Obispo, Ca. 93406

**ANNUAL COMPLIANCE TEST**  
June 26, 1991

**COALINGA STATION  
PIPELINE PLANT  
ENGINES #1**

Prepared By:

**BTC ENVIRONMENTAL, INC.**  
1536 Eastman Avenue  
Ventura, CA 93003

Job Number  
21000

Laboratory Report Number  
291-101

Test Team Leader  
Tom Porter

Results Verified By:  
Tom Porter  
Vice President - Air Test Division

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### EMISSION SUMMARY

CONSTITUENT	Engine #1			AVERAGE
	RUN #1	RUN #2	RUN #3	
<b>Oxides of Nitrogen</b>				
ppm by volume	1646	1621	1748	<b>1672</b>
ppm by volume @ 15% O <sub>2</sub>	473	463	499	<b>478</b>
lb/hr	17.45	17.19	18.53	<b>17.72</b>
<b>Carbon Monoxide</b>				
ppm by volume	10491	10543	10161	<b>10398</b>
ppm by volume @ 15% O <sub>2</sub>	3012	3012	2903	<b>2976</b>
lb/hr	67.71	68.05	65.58	<b>67.11</b>
<b>Reactive Organic Compounds</b>				
ppm by volume	48	46	45	<b>46</b>
lb/hr	0.35	0.34	0.33	<b>0.34</b>

## **INTRODUCTION**

July 22, 1991

Job Number : 21000  
Lab Number : 291-101

**UNOCAL**

P.O. Box 661  
San Luis Obispo, California 93406

**ATTENTION:** Ted Panos

**REGARDING:** Source Emission Testing of an Enterprise Natural Gas Fired Engine (#1) at the Coalinga Station Pipeline Facility.

Dear Mr. Panos.

On June 26, 1991, BTC Environmental performed nitrogen oxides, carbon monoxide and reactive organic compounds testing on an Enterprise Model GSG-8 natural gas fired engine located at the Coalinga Station Pipeline Facility.

**Exhaust Gas Analysis:** Continuous samples of the exhaust gases were taken from the exhaust outlet. The nitrogen oxides were checked with a Monitor Labs model 8440 chemiluminescent NOx analyzer. The carbon monoxide were checked with TECO model 48H NDIR/GFC analyzer. The oxygen was checked with a Teledyne model 320AX analyzer. The method used was CARB 1-100 with data collected for two hours.

**Fuel Gas Analysis:** A sample of the fuel gas was taken from the site and an analysis for the various constituents was performed by gas chromatography with FID.

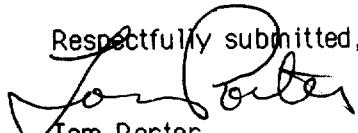
**Exhaust Gas Flow Rate:** The exhaust gas flow rate was calculated from the fuel flow rate and the stoichiometric molal combustion of fuel gas ( expansion factor ) from the fuel gas analysis.

**Fuel Flow Rate:** The fuel flow rate was supplied to BTCE by UNOCAL.

**Reactive Organic Compounds:** The reactive organic compounds ( ROC ) content of the exhaust gases during the test were determined by gas chromatography with FID. Three (3) samples per engine were taken in Tedlar bags according CARB Method 18.

If there are any questions concerning the above test method or the following results please contact the undersigned at 805-644-1095.

Respectfully submitted,



Tom Porter

Vice President - Air Test Division

## **CALCULATIONS**

**CONTINUOUS EMISSIONS MONITORING - CARB METHOD 1-100**

Client : UNOCAL  
Site : Coalinga Station  
Unit : Engine #1

Date : 6/26/91  
Job\* : 21000  
Lab\* : 291-101

**FIELD DATA**

Test Length 60 mins. Points 13

Standard Temperature  
Flowrate (Q)

<u>60</u>	- F
<u>1458</u>	dscfm

**Drift Corrected Emissions Data**

**Outlet Run #1**

NOx	<u>1646</u>	ppmv.
O2	<u>0.3</u>	%
CO	<u>10491</u>	ppmv

*Equations used:*

NOx or CO @ 15% O2 = [ ppmv ] \* (5.9/(20.9-02%))  
NOx lbs/hr(cnty.) = ppm \* (46 \* (1.581\*10^-7/60)) \* Q \* 60  
CO lbs/hr(cnty.) = ppm \* (28 \* (1.581\*10^-7/60)) \* Q \* 60

**CALCULATED EMISSIONS**

**OUTLET**

NOx	<b>1646</b>	ppmv
NOx @ 15% O2	<b>473</b>	ppmv
NOx	<b>17.45</b>	lb/hr
CO	<b>10491</b>	ppmv
CO @ 15% O2	<b>3012</b>	ppmv
CO	<b>67.71</b>	lb/hr

**CONTINUOUS EMISSIONS MONITORING - CARB METHOD 1-100**

Client : UNOCAL  
Site : Coalinga Station  
Unit : Engine #1

Date : 6/26/91  
Job# : 21000  
Lab# : 291-101

**FIELD DATA**

Test Length 60 mins. Points 13

Standard Temperature  
Flowrate (Q)

<u>60</u>	° F
<u>1458</u>	dscfm

**Drift Corrected Emissions Data**

**Outlet-Run #2**

NOx  
O<sub>2</sub>  
CO

1621	ppmv.
0.2	%
10543	ppmv

*Equations used:*

NOx or CO @ 15% O<sub>2</sub> = [ ppmv ] \* (5.9/(20.9-02%))  
NOx lbs/hr(cnty.) = ppm \* (46 \* (1.581\*10^-7/60)) \* Q \* 60  
CO lbs/hr(cnty.) = ppm \* (28 \* (1.581\*10^-7/60)) \* Q \* 60

**CALCULATED EMISSIONS**

**OUTLET**

NOx	<b>1621</b>	ppmv
NOx @ 15% O <sub>2</sub>	<b>463</b>	ppmv
NOx	<b>17.19</b>	lb/hr

CO	<b>10543</b>	ppmv
CO @ 15% O <sub>2</sub>	<b>3012</b>	ppmv
CO	<b>68.05</b>	lb/hr

**CONTINUOUS EMISSIONS MONITORING - CARB METHOD 1-100**

Client : UNOCAL  
Site : Coalinga Station  
Unit : Engine #1

Date : 6/26/91  
Job# : 21000  
Lab# : 291-101

**FIELD DATA**

Test Length 60 mins. Points 13

Standard Temperature  
Flowrate (Q)

60	° F
1458	dscfm

**Drift Corrected Emissions Data**

*Outlet-Run #3*

NOx  
O2  
CO

1748	ppmv.
0.2	%
10161	ppmv

*Equations used;*

$$\text{NOx or CO } @ 15\% \text{ O}_2 = [\text{ppmv}] * (5.9/(20.9-02\%))$$
$$\text{NOx lbs/hr(ctny.)} = \text{ppm} * (46 * (1.581 * 10^{-7}/60)) * Q * 60$$
$$\text{CO lbs/hr(ctny.)} = \text{ppm} * (28 * (1.581 * 10^{-7}/60)) * Q * 60$$

**CALCULATED EMISSIONS**

**OUTLET**

NOx	<b>1748</b>	ppmv
NOx @ 15% O <sub>2</sub>	<b>499</b>	ppmv
NOx	<b>18.53</b>	lb/hr

CO	<b>10161</b>	ppmv
CO @ 15% O <sub>2</sub>	<b>2903</b>	ppmv
CO	<b>65.58</b>	lb/hr

## EXHAUST GAS HYDROCARBON ANALYSIS

Client : UNOCAL  
 Site : Coalinga Junction  
 Unit : Engine #1

Date : 6/26/91  
 Job #: 21000  
 Lab #: 291-101  
 Fuel: Nat Gas

### FIELD AND LAB DATA

Exhaust Flow Rate, Q(std): 

1,458
0.2
60

 dscfm  
 Exhaust Outlet O2(AVG): 

%
• F

  
 Standard Temperature, T std: 

60
----

 °F

Components	NMHC #1		NMHC #2		NMHC #3	
	ppmv	lb/hr	ppmv	lb/hr	ppmv	lb/hr
Methane (C1)	661	-	631	-	613	-
Ethane (C2)	41	0.28	40	0.28	39	0.27
Propane (C3)	6.7	0.07	5.7	0.06	5.9	0.06
Butanes (C4)	< 0.1	< 0.001	< 0.1	< 0.001	< 0.1	< 0.001
Pentanes (C5)	< 0.1	< 0.002	< 0.1	< 0.002	< 0.1	< 0.002
Hexanes+ (C6+)	< 0.1	< 0.002	< 0.1	< 0.002	< 0.1	< 0.002
<b>Totals</b>	<b>48</b>	<b>0.35</b>	<b>46</b>	<b>0.34</b>	<b>45</b>	<b>0.33</b>

The above constituents are measured by gas chromatography using FID.

T factor =  $60 * 29.92 * 10^{-6} / (21.85 * (460 + T_{std}))$

MQL of (C1-C6) = 0.1 ppmv

lb/hr =  $Q(\text{std}) * [\text{ppmv}] * \text{MW of C} * \text{T factor}$

NMHC @ 15% O2 =  $[\text{ppmv}] * (5.9 / (20.9 - 0.2\%))$

### RESULTS

**13      ppmv    @ 15% Outlet O2**  
**46      ppmv**  
**0.34    lb/hr**

**FUEL GAS COMBUSTION : EXHAUST FLOW RATE & F-FACTOR**

Client : <u>UNOCAL</u>	Date : <u>6/26/91</u>
Site : <u>Coalinga Station</u>	Job #: <u>21000</u>
Unit : <u>Engine #1</u>	Lab #: <u>291-101</u>

Fuel Flow Rate: 170 scfm  
 Outlet Exhaust O2(Avg) : 0.2 %  
 Fuel Energy/Volume, hhv : 999 btu/scf

<b>Components</b>	<b>Mole %</b>	<b>sdcf Exhaust/scf Fuel (Expansion Factors)</b>
Air	2.78	* (0.0100) = 0.028
CO2	1.30	* (0.0100) = 0.013
Methane	93.21	* (0.0857) = 7.988
Ethane	2.12	* (0.1525) = 0.323
Propane	0.46	* (0.2192) = 0.101
Butanes	0.09	* (0.2860) = 0.026
Pentanes	0.02	* (0.3528) = 0.007
Hexanes	0.02	* (0.4195) = 0.008
<hr/>		<hr/>
<b>Totals</b>	<b>100.00</b>	<b>8.494</b>

**EXHAUST FLOW RATE** =  $(\text{scfm Fuel}) * \text{Expansion Factor Sum} * 20.92 / (20.92 - 02\%)$   
 = 1458 sdcfm

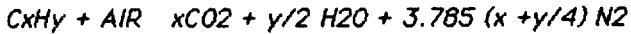
**F-FACTOR** =  $\text{Expansion Factor Sum} * 10^6 / (\text{btu/scf Fuel})$   
 = 8503 sdcf Exhaust/MM btu

**METHOD**

Exhaust gas flow rates (sdcfm) are calculated from the fuel gas rates to the engines, the factor for the combustion of the gases when stoichiometrically burned in air, and the oxygen content of the exhaust gases. The "Expansion Factor" determines the cubic feet of exhaust gases (on a dry std. basis) produced per cubic foot of fuel burned. The F-Factor is used to calculate emissions in : lbs/10^6 btu.

**STOICHIOMETRIC COMBUSTION OF HYDROCARBONS**

The exhaust volume concentration of each fuel gas component is determined by the general equation for the stoichiometric combustion of a gaseous hydrocarbon CxHy in air :



Therefore, for each mole (or standard cubic foot) of each fuel gas component CxHy, There will be :

1 SCF of CxHy produces  $4.785x + 0.946y$  SDCF of flue gas.

Where: x = # of carbon atoms in component CxHy      y = # of hydrogen atoms in component CxHy

If non-combustible components such as N2, O2 or CO2 are present in the gaseous fuel, these will not participate in the combustion process.

1 SCF Non-combustible component produces 1 SCF of flue gas.

**BTC ENVIRONMENTAL**  
**EPA methods 2, 3, 4, 5, 6, 8**

**CONSTANTS & CONVERSIONS**

Tstd = 60, 68, or 70 °F	1 in. Hg = 13.6 in. H2O
Pstd = 29.92 in. Hg	1 lb = 453.6 g
R = 21.85(in. Hg-cu ft/lb mole-°R)	1 lb = 7000 grain
Dw = 0.9982(g/ml)	1 g = 15.432 grain
MW(H2O) = 18.0 lb/lb mole	1 mg = 0.001 g
MW(Sulfur) = 32.03 lb/lb mole	1 hr = 60 min.
M(H2SO4) = 98.08 lb/lb mole	1 part/vol X = 1*10^6 ppmv X
MW(SO2) = 64.06 lb/lb mole	1 bbl = 42 gal
K(H2SO4) = 0.5 mg-g mole/g-meq	M = 1000
K(SO2) = 0.5 mg-g mole/g-meq	La = 0.02 cfm
Kp = 85.49(ft/sec(sqrt{lb/lb mole-in.Hg/°R-in. H2O}))	
Kw,[cu ft/g-°R] = R / (453.6*MW(H2O)*Pstd)	
Kf,[scf-ppm/lb mole] = R * (Tstd+460) * (1*10^6) / Pstd	

**INTERMEDIATE CALCULATIONS**

F,[scf/MMBtu] = F Factor * ( Tstd + 460 ) / 528
Ph,[in. Hg] = Pbar + ( ΔH / 13.6 )
N2,[%] = 100 - (O2% + CO2%)
Vlc,[ml] = Ww / Dw
Qa,[cfm] = 60 * Vs * As
Qad,[dcfm] = Qa * (1 - Bws)

**CFR 40 - EPA EQUATIONS**

eq. 2-8	T[°R] = T[°F]+460
eq. 2-6	Ps, [in. Hg] = Pbar+(Pg/13.6)
eq. 5-3	Bws, [%] = Vw(std) / { Vw(std) + Vm(std) }
eq. 3-2	Md, [lb/lb-mole] = 0.44*CO2%+0.32*O2%+0.28*(N2%+CO%)
eq. 2-5	Ms, [lb/lb mol] = Md*(1-Bws)+(MW(H2O)*Bws )
eq. 5-2	Vw(std), [scf] = Ww * Kw * (Tstd+460)
eq. 5-1	Vn, [cf] = Vm - ((Lp-La) * Theta)
eq. 5-1	Vm(std), [scdf] = Vm * Y * ( (Tstd+460) / (Ts+460) ) * Ph / Pstd
eq. 2-9	Vs, [ft./sec.] = Kp*Cp*(ΔP*(Ts+460)/( Ps*Ms))^0.5
eq. 2-10	Qstd, [dscfm] = Qad*(Tstd+460)*Ps/((Ts+460)*Pstd)
eq. 5-8	I,[%] = 100*(Ts+460)*Vm(std)*Pstd/(60*Vs*Theta*An*Ps*(1-Bws)*(Tstd+460))
eq. 5-6	Cx, [grain/dscf] = Wx,g*15.432/Vm(std)
eq. 8-2,3	Wx, [mg] = (Vt-Vtb)*N(std)*(Vsln/Valq)*MWx*Kx
	Cx, [grain/dscf] = Wx,mg*0.001*15.432/Vm(std)
	CWx, [grain/scf] = Cx*(1-Bws)
	CCx, [grain/dscf @ 12% CO2] = Cx*12.0/CO2%
	CWCx, [grain/scf @ 12% CO2] = CCx
	CPx, [ppmv dry] = Cx*Kf/(MWx*7000)
	CPCx, [ppmv @ N% O2] = CPX* ((20.9-N%)/(20.9-O2%))
	CFx, [lb/hr] = Cx*Q(std)*60/7000
	CEx, [lb/MMBtu] = F*(Cx/7000)*(20.9/(20.9-O2%))
	CBx, [lb/bbl] = CEx*(Fuel Btu/MM)*(Fuel lb/gal)*42
	CEsx, [lb S/MMBtu] = CEx*(MW(S) / MWx)

Where x represents, Particulate, Sulfuric Acid, Sulfate, or Sulfur Dioxide respectively.

**LABORATORY ANALYSIS**

BTC Environmental, Incorporated  
1536 Eastman Avenue, Suite B  
Ventura, CA. 93003  
(805) 644-1095

Prepared For: BTCE Air Department      July 12, 1991

ATTENTION: Tom Porter

Laboratory No: 911228      Job No: 291-101  
Date Received: 26-JUN-91      Sampled By: Tom  
Client: Unocal Coalinga

**RESULTS**

On June 26, 1991 four (4) samples were received for analysis by BTC Environmental, Inc. The samples were identified and assigned the lab numbers listed below.

<u>SAMPLE DESCRIPTION</u>	<u>BTCE LAB NUMBER</u>
HC#1 Eng#1	91122801
HC#2 Eng#1	91122802
HC#3 Eng#1	91122803
Natural Gas Sample	91122804

BTC Environmental, Incorporated  
1536 Eastman Avenue, Suite B  
Ventura, CA. 93003  
(805) 644-1095

Client: Airlab (Unocal-Coalinga) Date Analyzed: 26-JUN-91  
Matrix: Gas - Engine #1  
Lab No: 911228

LOW LEVEL HYDROCARBONS

Lab #:	91122801	91122802	91122803
HC #:	1	2	3
Time:	02:00	03:15	03:30

Species	PPM	PPM	PPM
Methane	661	631	613
Ethane +	41	40	39
Propane +	6.7	5.7	5.9
Butane +	BQL	BQL	BQL
Pentane +	BQL	BQL	BQL
Hexane +	BQL	BQL	BQL
Total	709	677	658
Total Non-CH <sub>4</sub>	48	46	45

Analyst: VDV  
Date Analyzed: 01-JUL-91

Job Number : Air Lab (Unocal)  
Lab Number : 911228  
Attention : Tom Porter

Regarding : Fuel Gas Analysis

The sample of natural gas collected on 26 Jun 91 has been analyzed for composition by use of gas chromatography with FID. The sample was identified as :

The results are as follows :

Constituent	Mole Percent	Gals/Mft3
Oxygen	0.75	
Nitrogen	2.03	
Carbon Dioxide	1.30	
Methane	93.21	
Ethane	2.12	
Propane	0.46	0.127
Iso-Butane	0.04	0.013
N-Butane	0.05	0.016
Iso-Pentane	0.01	0.004
N-Pentane	0.01	0.004
Hexane (Plus)	0.02	0.008
Total	100.00	G/M: 0.171
Specific Gravity	0.596	
BTU (hhv)	999	
BTU (lhv)	901	

BTC ENVIRONMENTAL, INC.  
1536 EASTMAN AVENUE  
VENTURA, CA 93003  
(805) 644-1095

METHODS

**Inorganic Analyses of Water and Wastewater:**

1. Standard Methods for the Evaluation of Water and Wastewater  
APHA, AWWA, WPCF, 16th Edition.
2. Methods for Chemical Analysis of Water and Wastes, USEPA, EPA-600/4-79-020 Revised March, 1983.

**Soils, Sediments and Hazardous Waste Evaluation Procedures:**

1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, USEPA Second Edition, Revised April, 1984.

**Organic Analyses of Water and Wastewater:**

1. "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", 40 CFR Part 136, Appendix A, USEPA, Amended June 30, 1986.

**Aggregate/Sand & Petroleum Products:**

1. Annual Book of American Standard Test Methods, amended 1988

Dan Farah

Dan Farah  
Analytical Lab Director

7/15/91

Date

Chrystal Craver

Chrystal Craver  
Inorganics Supervisor

15 July 1991

Date

**BTC**

ENVIRONMENTAL  
INCORPORATED

***FIELD DATA &  
STRIP CHARTS***

Date: 6/26/91

Page 1 of 3

## Emissions Test - C.A.R.B. Method 100

## \*\* TEST INFORMATION \*\*

## Personnel

Client : UNOCAL  
 County : Fresno  
 Site(s) : Coalinga Station  
 Unit(s) : Eng #1

ETC : TP  
 Client: Ted Panos  
 APCD :

Run Length: 60 min. Inlet( ) Outlet(\*)  
 No. of Pts.: 13 S.T. (\*) E.I. ( ) Data( )  
               Fuel(\*) HC's(\*) H2S ( ) NH3 ( )

Time	Baro.	Temp.	Weather
------	-------	-------	---------

Arrive:	7:30 am	29.30 in.Hg	60 F	Clear & Calm
Depart:	5:00 pm	29.00 in.Hg	80 F	Clear & Calm

## \*\* INSTRUMENT INFORMATION \*\*

"On"	Unit#	Make / Model	Vacuum	Time	Cnst.	Span	Set
Outlet NOx:	4	6 Monitor Labs 8440	27 in.Hg		5 sec.		6.72
" O2 :	4	5 Teledyne 320AX					
" CO :	4	4 TECO Model 48H					

Recorders : 1 5 Soltec / 6 cont.-pens 10 cm/hr

## \*\* CALIBRATION INFORMATION \*\*

Units	Zero	Span	Range	Gas Cyl.#	Sys.	Chk.
Outlet NOx: ppm	1000	4210	10000	CC 68814		84
" O2 :	%	3.84	5	CC 40036		0
" CO :	ppm	17750	20000	CC 567		0

Chnl.	Pen Type	Color
-------	----------	-------

Outlet NOx:	3	Cont.	Purple
" O2 :	4	Cont.	Green
" CO :	5	Cont.	Brown

Emissions Data - C.A.R.B. Method 100

Client : UNOCAL Unit : Eng #1  
Site : Coalinga Station Run # : 1

Times : Beg.Cal@ 11:00 am Start@ 12:55 pm Stop@ 1:55 pm End Cal@ 2:10 pm

## \*\*\* MEASURED EMISSIONS COMPONENTS 本稿

Source : Out Out Out  
Component: NOx O2 CO  
Units : ppm % ppm

\*\*\* INSTRUMENT CAL RANGE, SPAN & DATA RANGE \*\*\*

D. Range : 2500 5 20000  
 Span : 1684 3.84 17750  
 D. Range : 2500 5 20000

\* RAW EMISSIONS DATA \*

12:55 pm		1500	0.3	10500
5		1550	0.3	9775
10		1600	0.3	9990
15		1700	0.3	9550
20		1675	0.3	9350
25		1650	0.3	10825
30		1590	0.3	10500
35		1560	0.3	11030
40		1600	0.3	10630
45		1510	0.3	11450
50		1575	0.3	10625
55		1525	0.3	11160
60		1550	0.3	11000

1583 O. A. 10491

Maximum : 1700 0.3 11450  
 Minimum : 1500 0.3 9350

## \* \* CALIBRATION ADJUSTMENTS \* \*

Zero : -12 0.0 0  
Span : 146 0.2 0

DRIFT CORRECTED EMISSIONS

Average : 1646 0.3 10491

## NOTE

15

```
DCAvg = (RawAvg+(ZeroAdj/2)*(DataRng/CalRng)) * (1+(SpanAdj/(2*CalSpan)))
```

Emissions Data - C.A.R.B. Method 100

Client : UNOCAL Unit : Eng #1  
Site : Coalinga Station Run # : 2

Times : Bed.Cal@ Start@ 2:10 pm Stop@ 3:10 pm End Cal@3:20 pm

## MEASURED EMISSIONS COMPONENTS

Source : Out Out Out  
Component: NOx O2 CO  
Units : ppm % PPM

\*\*\* INSTRUMENT CAL RANGE, SPAN & DATA RANGE \*\*\*

D. Range : 2500 5 20000  
Span : 1684 3.84 17750  
 D. Range : 2500 5 20000

\* RAW EMISSIONS DATA \*

2:10 pm		1675	0.3	10830
—	5	1710	0.3	10525
—	10	1700	0.3	10550
—	15	1575	0.3	10300
—	20	1550	0.3	10800
—	25	1575	0.2	10425
—	30	1550	0.2	10690
—	35	1550	0.2	10690
—	40	1550	0.2	10730
—	45	1600	0.2	10350
—	50	1575	0.2	10320
—	55	1600	0.2	10160
—	60	1575	0.2	10500

1599 N. O. N. 10528  
...-DAV

Maximum : 1710 0.3 108300  
 Minimum : 1550 0.2 101600

\* \* \* CALIBRATION ADJUSTMENTS \* \* \*

- Zero : 0 0.0 0  
Span : 46 0.0 50

\*\*\* DRIFT CORRECTED EMISSIONS \*\*\*

Average : 1621 0.2 10543

## NOTE S

## Emissions Data - C.A.R.B. Method 100

Client : UNOCAL  
 Site : Coalinga Station

Unit : Eng #1  
 Run # : 3

Times : Beg.Cal@ Start@ 3:20 pm Stop@ 4:20 pm End Cal@4:45 pm

## \*\* MEASURED EMISSIONS COMPONENTS \*\*

Source :	Out	Out	Out
Component:	NOx	O2	CO
Units :	ppm	%	ppm

## \*\* INSTRUMENT CAL RANGE, SPAN &amp; DATA RANGE \*\*

A. Range :	2500	5	20000
B. Span :	1684	3.84	17750
C. Range :	2500	5	20000

## \*\* RAW EMISSIONS DATA \*\*

1:20 pm	1760	0.3	10010
5	1725	0.3	10675
10	1750	0.3	10040
15	1725	0.3	10420
20	1750	0.3	9950
25	1750	0.3	9810
30	1725	0.2	10260
35	1725	0.2	10360
40	1700	0.2	10500
45	1700	0.2	10270
50	1750	0.2	10145
55	1725	0.2	10490
60	1800	0.2	9730
Raw Avg. :	1737	0.2	10205
Maximum :	1800	0.3	10675
Minimum :	1700	0.2	9730

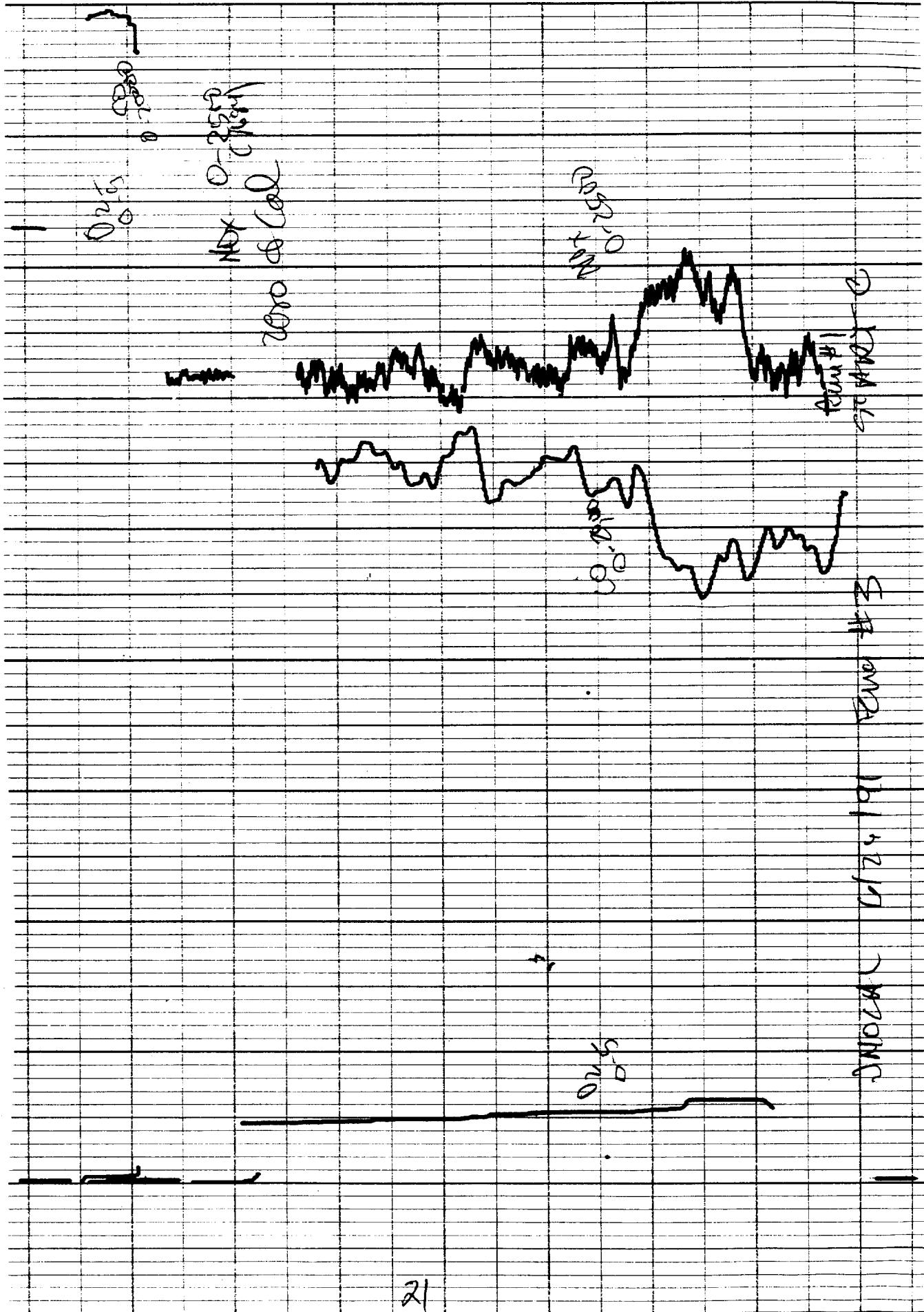
## \*\* CALIBRATION ADJUSTMENTS \*\*

Zero :	0	0.0	0
Span :	20	0.0	-150

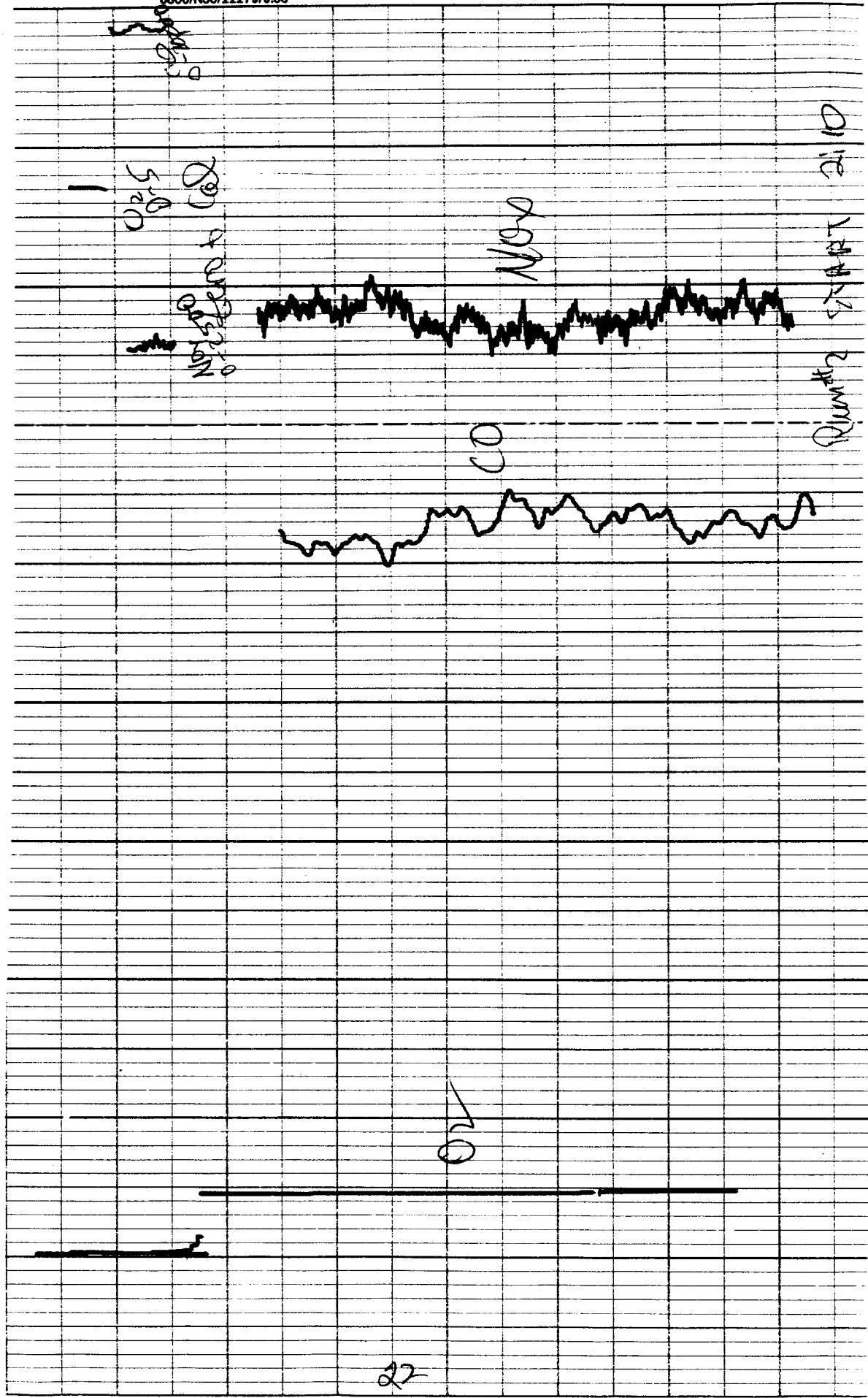
## \*\* DRIFT CORRECTED EMISSIONS \*\*

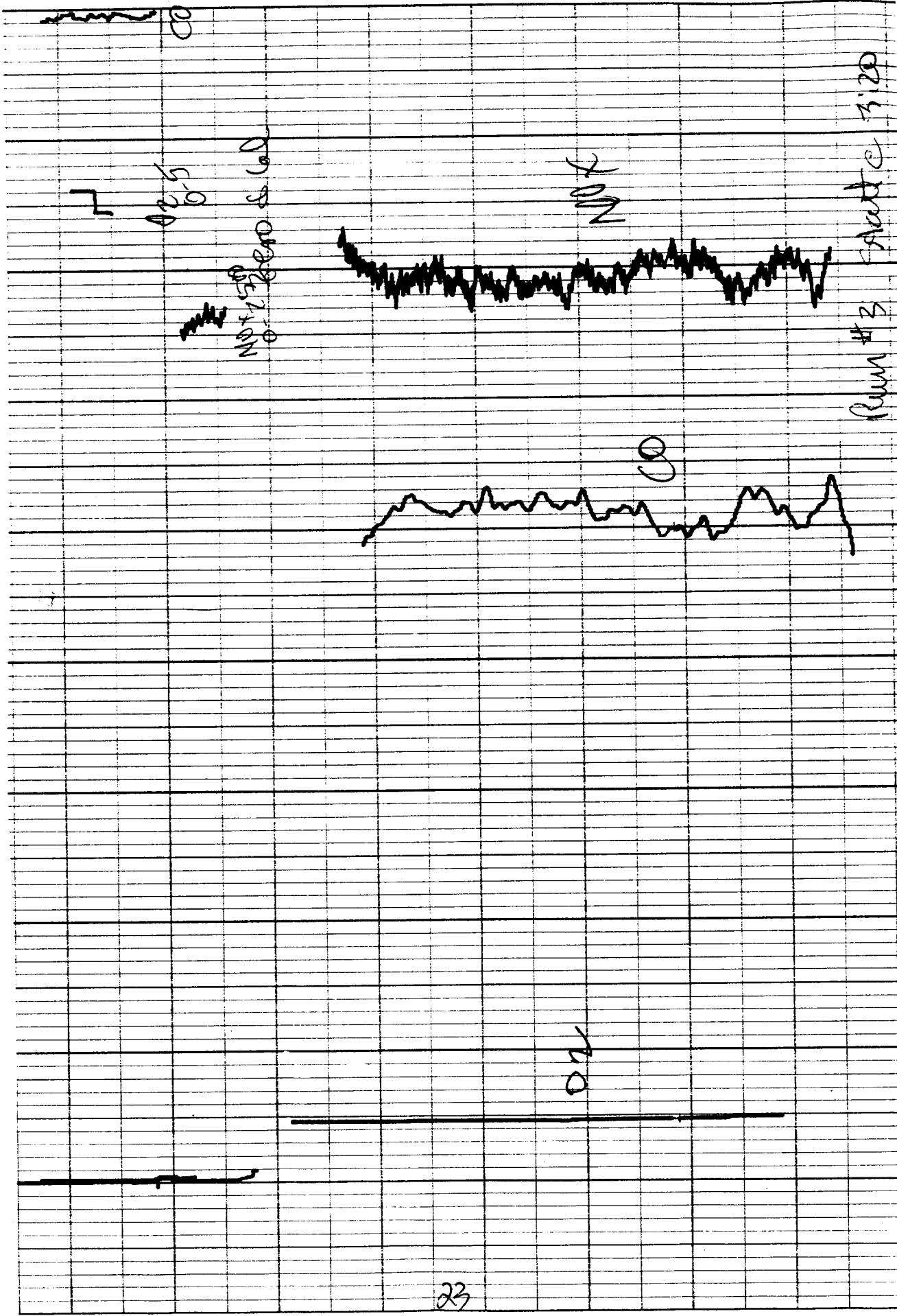
Average :	1748	0.2	10161
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## \*\* NOTES \*\*



0806/N50/22279/9.88





## SOURCE EMISSION TEST DATA FOR COMBUSTION ENGINES

Client: Urgent  
Site: Coalinga  
Unit: Eng #3

Date: 6/26/91  
Job#: 21000  
Lab#: 791-101

### ENGINE DATA

Manufacturer: Enterprise  
Model No.: MSB-8 Serial No.: 57006

APCD Permit No.: \_\_\_\_\_  
Horsepower: Rated: 765 Tested: \_\_\_\_\_  
RPM: Rated: 525 Tested: 460

Engine Type:  Rich Burn  ( ) Turbo / Supercharged  
 Lean Burn  ( ) Clean Burn  
 ( ) 2 Stroke  ( ) EGR Equiped  
 4 Stroke  ( ) PSC System  
 Other, Specify \_\_\_\_\_

Annual Engine Hours: 7500  
Fuel Type: Natural Gas  
Fuel Usage: 170 cfs/min

### CONTROL DEVICE DATA

Type of Device: NONE  
Manufacturer: \_\_\_\_\_  
Model No.: \_\_\_\_\_  
Serial No.: \_\_\_\_\_

Engine Hours on Control Device: \_\_\_\_\_ Inlet Temp.: \_\_\_\_\_ °F Outlet Temp.: \_\_\_\_\_ °F

### MISC. DATA

Operators Name / Title: Brandon Mech.  
Name and Setting of all Manually Adjustable Controllers:

A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

TYPE OF TEST	ANNUAL	QUARTERLY	INITIAL	DATA
H2S Test	( )	( )	( )	( )
Hydrocarbons	(X)	( )	(2)	( )
Fuel Bomb	(X)	( )	( )	( )
Ammonia Test	( )	( )	( )	( )

## ***INSTRUMENT INFORMATION***

## SOURCE EMISSION INSTRUMENTATION LIST

7/3/91

### OXIDES OF NITROGEN:

#### **Unit No. - 1**

**Manufacturer:** Monitor Labs  
**Model No.:** 8430H  
**Serial No.:** 116  
**Method:** Chemiluminescence  
**Range (ppmv):** 0-50, 100, 500, 1000 & 5000

#### **Unit No. - 2**

**Manufacturer:** Monitor Labs  
**Model No.:** 8840  
**Serial No.:** 302  
**Method:** Chemiluminescence  
**Range (ppmv):** 0-50, 100, 500, 1000, 5000 & 10,000

#### **Unit No. - 3**

**Manufacturer:** Monitor Labs  
**Model No.:** 8840  
**Serial No.:** 905  
**Method:** Chemiluminescence  
**Range (ppmv):** 0-50, 100, 500, 1000, 5000 & 10,000

#### **Unit No. - 4**

**Manufacturer:** Monitor Labs  
**Model No.:** 8440  
**Serial No.:** 1264  
**Method:** Chemiluminescence  
**Range (ppmv):** 0-100, 200, 500, 1000 & 1500

#### **Unit No. - 5**

**Manufacturer:** Thermo Environmental (TECO)  
**Model No.:** 10AR  
**Serial No.:** 26840-227  
**Method:** Chemiluminescence  
**Range (ppmv):** 0-2.5, 10, 25, 100, 250, 1000, 2500 & 10,000

#### **Unit No. - 6**

**Manufacturer:** Thermo Environmental (TECO)  
**Model No.:** 10AR  
**Serial No.:** 26886-227  
**Method:** Chemiluminescence  
**Range (ppmv):** 0-2.5, 10, 25, 100, 250, 1000, 2500 & 10,000

## SOURCE EMISSION INSTRUMENTATION LIST

7/3/91

### CARBON MONOXIDE:

#### **Unit No. - 1**

**Manufacturer:** Horiba  
**Model No.:** MEXA - 221  
**Serial No.:** 4615910  
**Method:** NDIR  
**Range (ppmv):** 0-1000 & 5000

#### **Unit No. - 2**

**Manufacturer:** Horiba  
**Model No.:** MEXA - 201E  
**Serial No.:** E10442  
**Method:** NDIR  
**Range (ppmv):** 0-1000 & 5000

#### **Unit No. - 3**

**Manufacturer:** Horiba  
**Model No.:** PIR - 2000  
**Serial No.:** 205015  
**Method:** NDIR  
**Range (ppmv):** 0-500, 1500 & 2500

#### **Unit No. - 4**

**Manufacturer:** Anarad  
**Model No.:** AR - 50  
**Serial No.:** 2376  
**Method:** NDIR  
**Range (ppmv):** 0-200

#### **Unit No. - 5**

**Manufacturer:** Thermo Environmental (TECO)  
**Model No.:** 48H  
**Serial No.:** 25184-219  
**Method:** NDIR/GFC  
**Range (ppmv):** 0-50, 100, 200, 500, 1000,  
2000, 5000, 10000, 20000  
& 50000

#### **Unit No. - 6**

**Manufacturer:** Thermo Environmental (TECO)  
**Model No.:** 48H  
**Serial No.:** 29031-233  
**Method:** NDIR/GFC  
**Range (ppmv):** 0-50, 100, 200, 500, 1000,  
2000, 5000, 10000, 20000  
& 50000

## SOURCE EMISSION INSTRUMENTATION LIST

7/3/91

### OXYGEN:

#### **Unit No. - 1**

**Manufacturer:** Taylor/Servomex  
**Model No.:** 0A580  
**Serial No.:** 508/702/497  
**Method:** Paramagnetic  
**Range (%):** 0-10, 25 & 100

#### **Unit No. - 2**

**Manufacturer:** Taylor/Servomex  
**Model No.:** 68771/B  
**Serial No.:** 68771/B  
**Method:** Paramagnetic  
**Range (%):** 0-100

#### **Unit No. - 3**

**Manufacturer:** Taylor/Servomex  
**Model No.:** 570A  
**Serial No.:** 4212B  
**Method:** Paramagnetic  
**Range (%):** 0-100

#### **Unit No. - 4**

**Manufacturer:** Teledyne  
**Model No.:** 320-AX  
**Serial No.:** 107294  
**Method:** Electrochemical  
**Range (%):** 0-5, 10 & 25

#### **Unit No. - 5**

**Manufacturer:** Teledyne  
**Model No.:** 320-AX  
**Serial No.:** 108743  
**Method:** Electrochemical  
**Range (%):** 0-5, 10 & 25

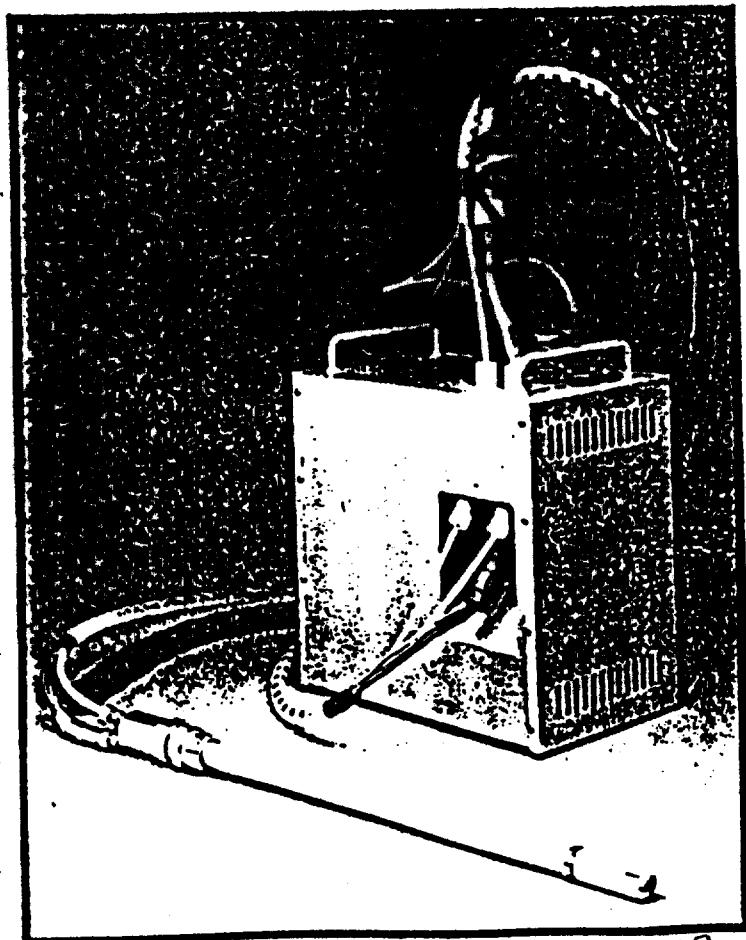
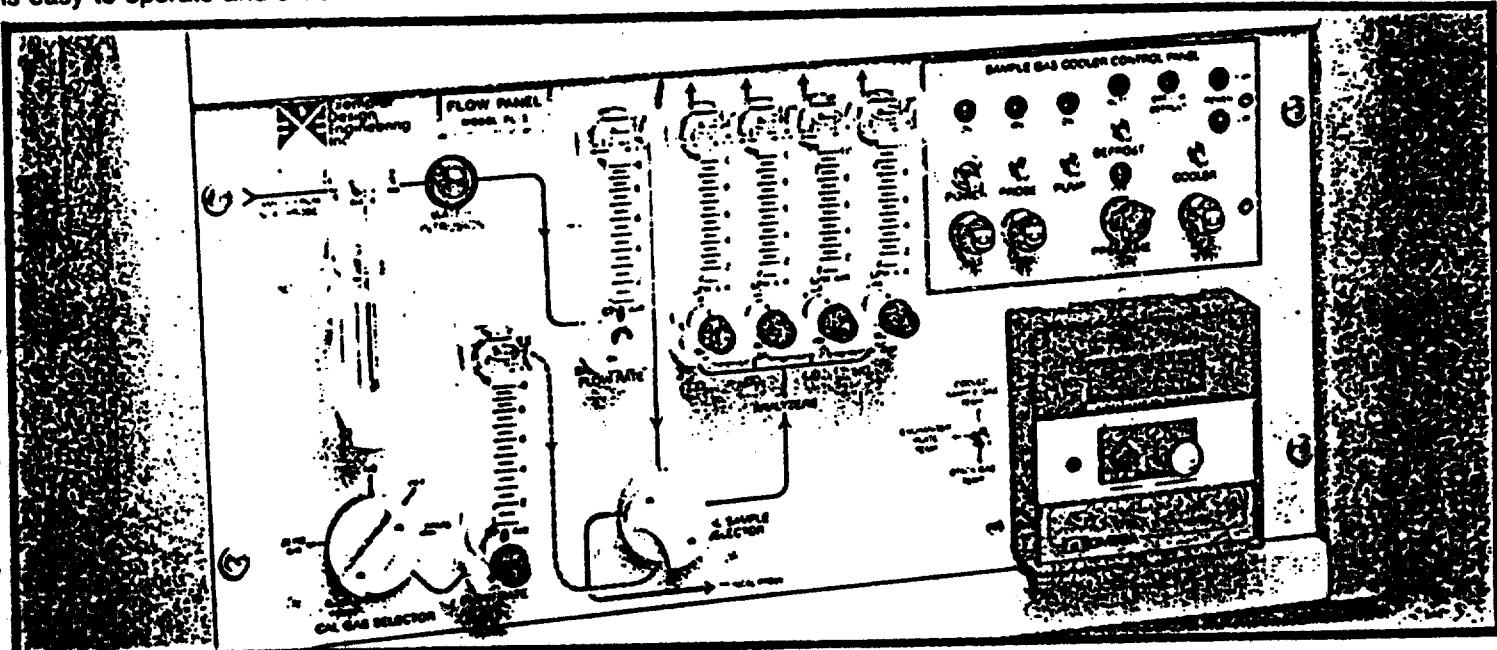
#### **Unit No. - 6**

**Manufacturer:** Teledyne  
**Model No.:** 320-AX  
**Serial No.:** 110649  
**Method:** Electrochemical  
**Range (%):** 0-5, 10 & 25

# Extractive Gas Sampling System

Model EGS-1 (Patent Applied For)

Exemplar's Extractive Gas Sampling System, Model EGS-1 is specifically designed to be a complete, easy to use, portable extractive gas sampling system for use with continuous gas analyzers. By combining individual Exemplar components, a complete system requires only the addition of user specified analyzers and calibration gases. The system is easy to operate and difficult to mis-calibrate.

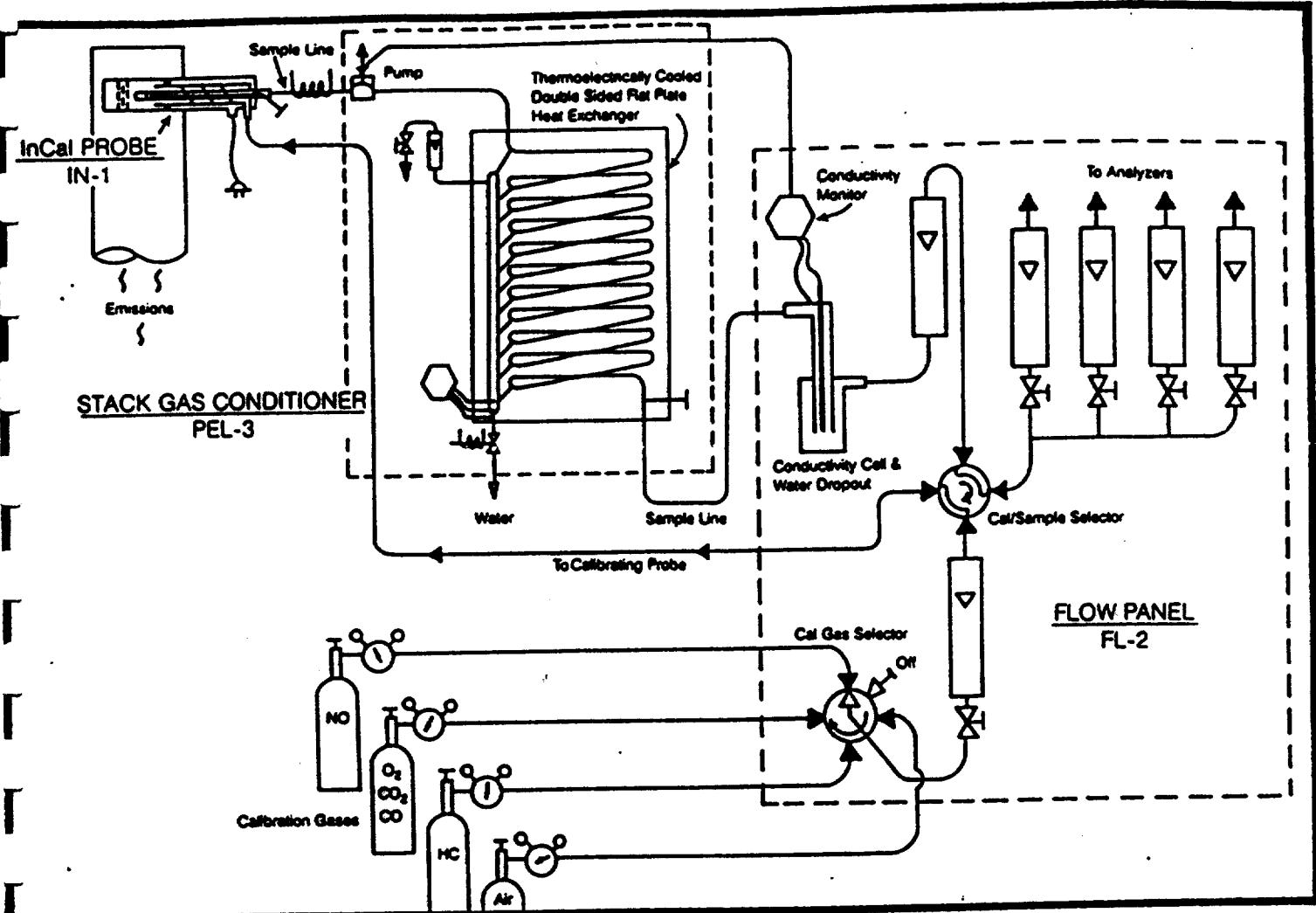


## SPECIAL FEATURES

- Simple to use; only requires connecting to analyzers, cal gases and electrical power.
- Easily portable; system, analyzers and cal gases will fit into and operate from the back of a standard station wagon.
- Highly accurate; both internal and external calibration from probe tip, system is easy to calibrate.
- High capacity and non-scrubbing; powerful thermoelectric coolers with special heat exchanger design removes condensing water as quickly as it is formed.
- Positive pressure design; eliminates concentration errors due to leaks.
- Corrosion and reaction resistant; sample contacts only non-reactive, non-absorbing materials.

## APPLICATIONS

- Use where EPA extractive sampling requirements are specified.
- Use where high accuracy is essential.
- Replace older, complex negative pressure systems.
- Complete extractive system without the need for a sampling van.
- Use where space is limited.



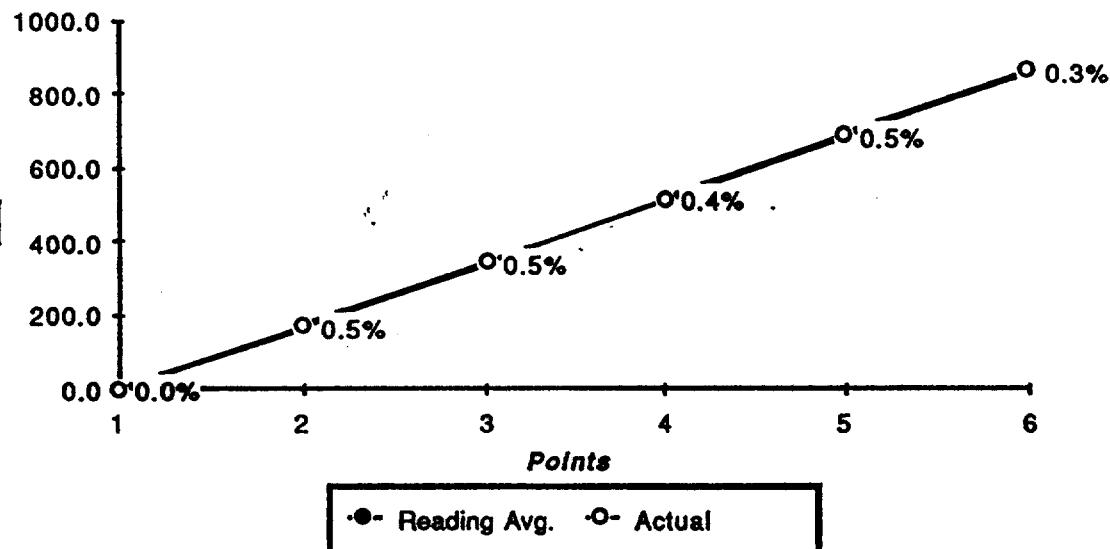
### Components

Exemplar's InCal IN-1 series of in-stream calibrating probes are used to provide filtered non-condensing sample gas from a wide range of sources. The probe's in-stream calibration feature allows the entire system (probe tip to analyzer) to be accurately calibrated. The probe's design, size and corrosion resistance make sample extraction easy.

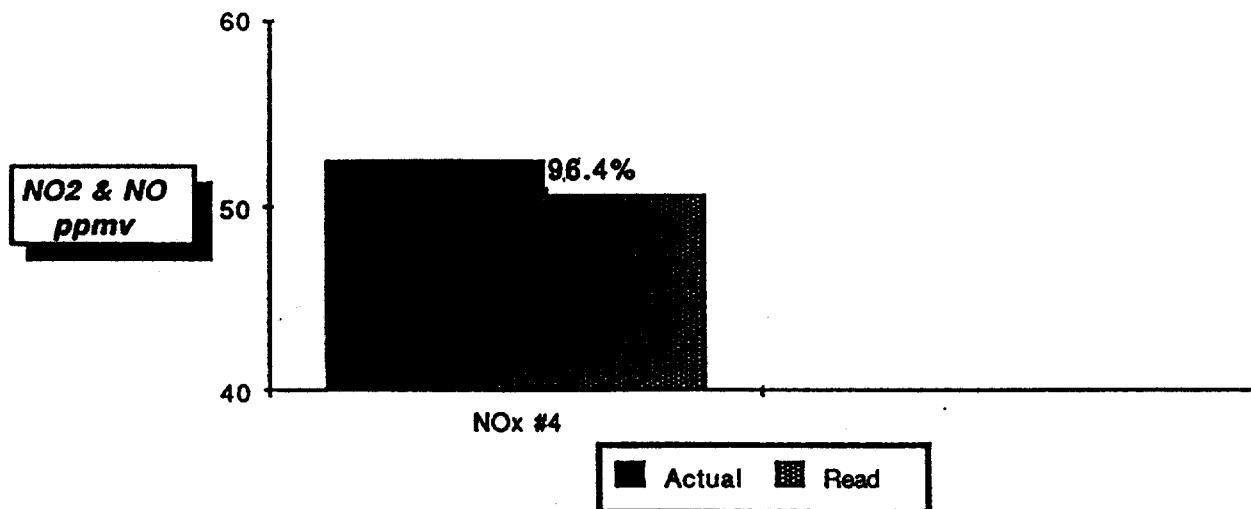
Exemplar's Sample Gas Conditioner PEL-3 provides the distribution panel with sample gas under positive pressure. A vibrating armature pump followed by a double sided, thermoelectrically cooled, flat plate heat exchanger with integral water separation channels, is capable of producing 5 lpm of 40°F dew point sample gas from a 160°F, water saturated (30%) sample stream. The condensing water dump is automatic allowing for continuous operation. The positive pressure nature of the system eliminates sample dilution due to tube fitting leaks. The unit is light weight and easily portable.

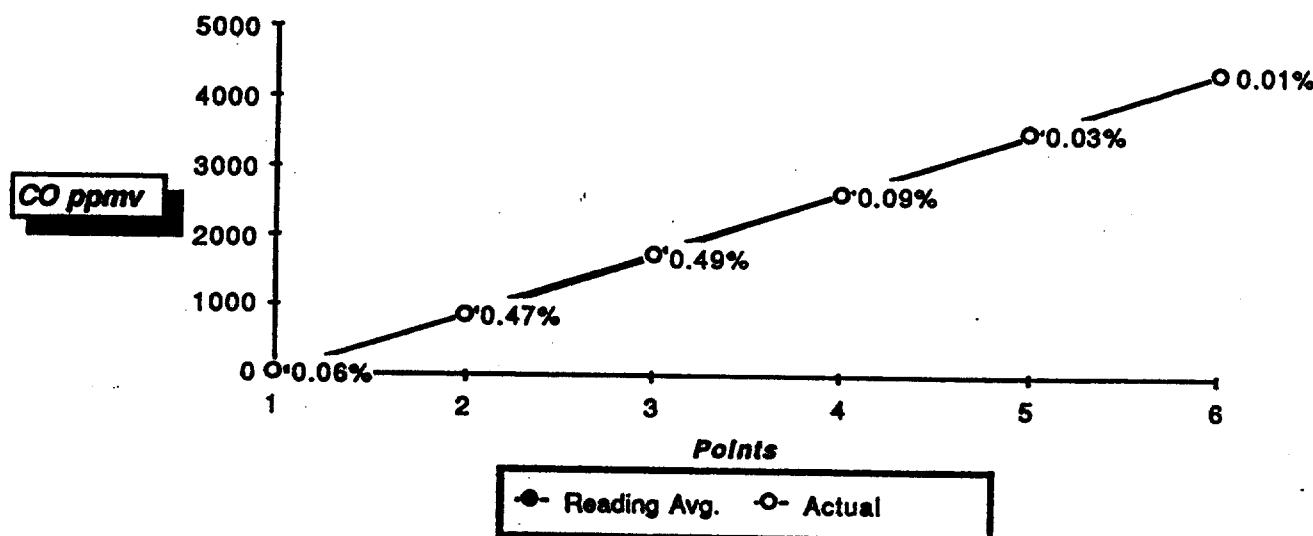
Exemplar's Sample Distribution Flow Panel FL-2 distributes dry, positive pressure, non-scrubbed sample gas to the appropriate instruments. The panel allows for both internal and probe tip calibration. Manual, click stop, rotary plug valves and an illustrative front panel provide leak free, fail-safe sample and calibration gas distribution. Flow paths are simple and easy to understand. This unit is small and easily transportable.

**Monitor 8440 #4 - October 11, 1989**

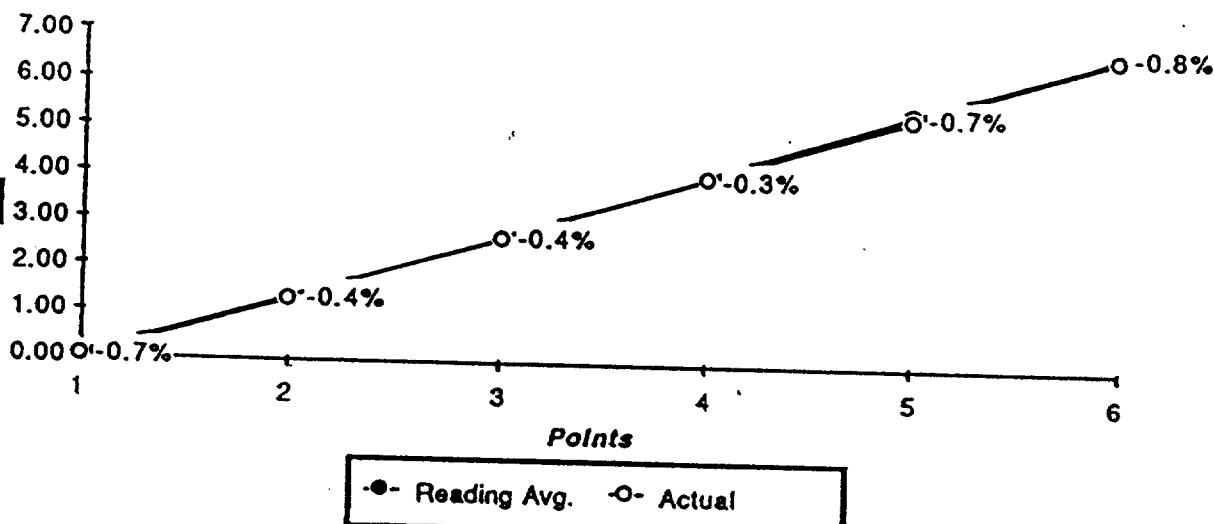


***NO<sub>2</sub> to NO Conversion Efficiency***  
***October 11, 1989***



**BTC**ENVIRONMENTAL  
INCORPORATED**TECO 48 H****unit #5****September 19, 1989**

Teledyne 320 AX - unit #5  
September 19, 1989



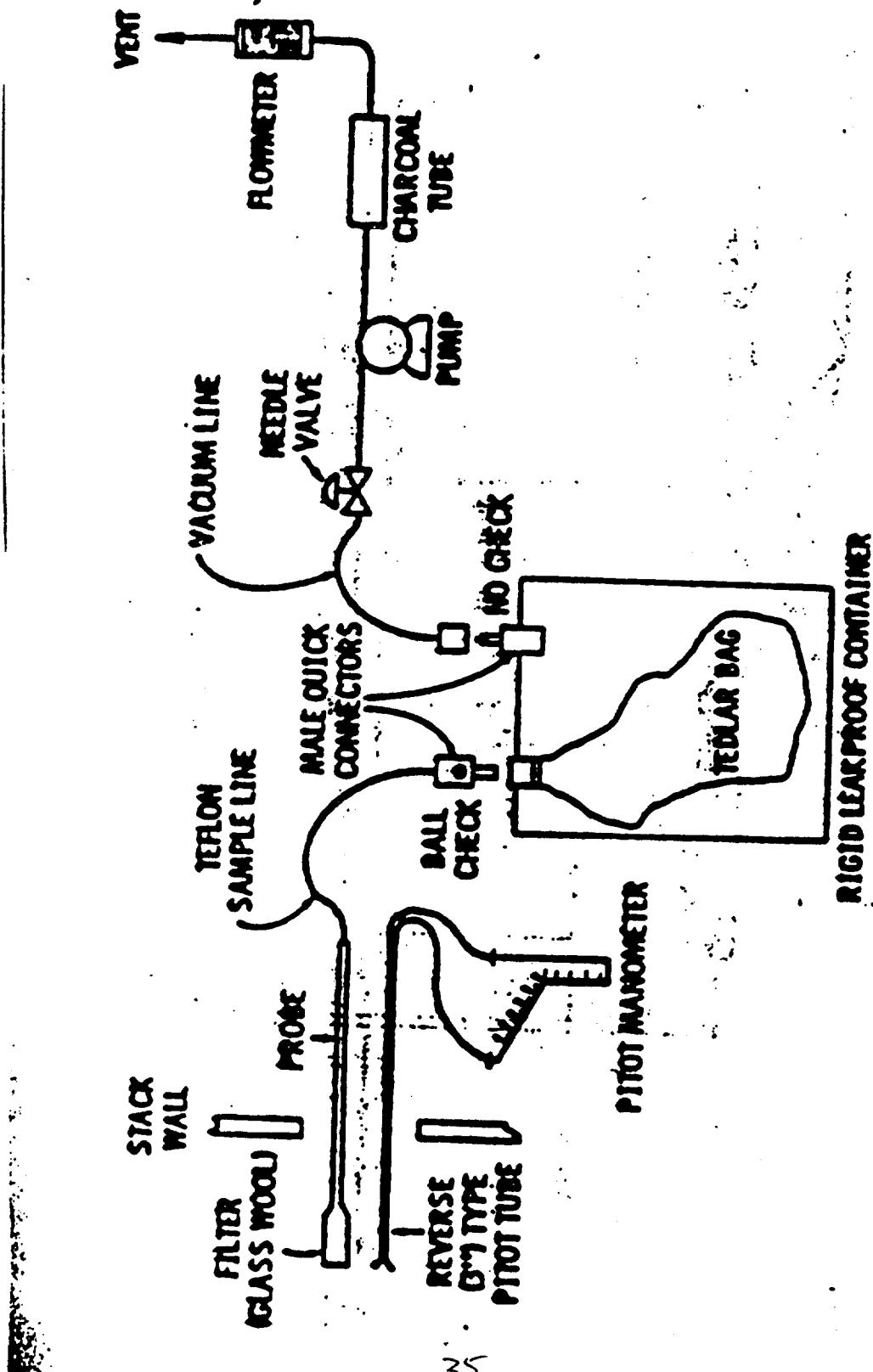


Figure 18-9. Integrated bag sampling train.

## **QUALITY ASSURANCE**



**SCOTT-MARRIN, INC.**  
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507  
TELEPHONE (714) 784-1240

## REPORT OF ANALYSIS

BTCE#1

**TO:**  
Tom Porter  
BTC Environmental  
1536 Eastman Ave.  
Ventura, CA 93003

**DATE:** 07 November 1990

**CUSTOMER ORDER NUMBER:** 3915

**CYLINDER NUMBER** CC28989

<b>COMPONENT</b>	<b>CONCENTRATION(v/v)</b>
Carbon Monoxide	17700 ± 180 ppm
Nitrogen	Balance

**CYLINDER NUMBER** CC567

<b>COMPONENT</b>	<b>CONCENTRATION(v/v)</b>
Carbon Monoxide	17750 ± 180 ppm
Nitrogen	Balance

---

**CYLINDER NUMBER** \_\_\_\_\_

**COMPONENT**      **CONCENTRATION(v/v)**

**CYLINDER NUMBER** \_\_\_\_\_

**COMPONENT**      **CONCENTRATION(v/v)**

**ANALYST**

M.S. Calhoun

**APPROVED**

J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.



**SCOTT-MARRIN, INC.**  
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507  
TELEPHONE (714) 784-1240

**REPORT OF ANALYSIS  
NIST TRACEABLE GAS MIXTURES**

BTCE01

**TO:**

**TOM PORTER  
BTC ENVIRONMENTAL  
1536 EASTMAN AVE. STE. B  
VENTURA, CA 93003**

**DATE:** 08/21/99

**CUSTOMER ORDER NUMBER: 3738**

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC91317	Nitric Oxide Nitrogen, O2-Free	8.53 + 0.09 ppm Balance	SRM 2628
CC40036	Oxygen Carbon Dioxide Nitrogen	3.84 + 0.04 % 14.89 + 0.15 % Balance	SRM 2658a SRM 1675b
CC49679	Oxygen Carbon Dioxide Nitrogen	3.83 + 0.04 % 14.88 + 0.15 % Balance	SRM 2658a SRM 1675b

ppm = umole/mole

$\dot{q}$  = mole- $\dot{q}$

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report No. MMAP 232.09/202491.

Analyst: Mark Monroe

**Approved:**

36

J.T. Marrin



4/16/90  
m  
**SCOTT-MARRIN, INC.**  
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507  
TELEPHONE (714) 784-1240

**REPORT OF ANALYSIS  
NIST TRACEABLE GAS MIXTURES**

BTCE01  
TO: Matthew Pena  
BTC Environmental  
1536 Eastman Avenue  
Suite B  
Ventura, CA 93003

DATE: 04/11/90

CUSTOMER ORDER NUMBER: 03264

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC83084	Nitric Oxide Nitrogen, O2-Free	429 $\pm$ 4 ppm Balance	SRM 1686b
CC68814	Nitric Oxide Nitrogen, O2-Free	4210 $\pm$ 42 ppm Balance	SRM 2631
CC68699	Nitric Oxide Nitrogen, O2-Free	84.6 $\pm$ 0.8 ppm Balance	SRM 1684B
CC73185	Nitric Oxide Nitrogen, O2-Free	85.7 $\pm$ 0.9 ppm Balance	SRM 1684B

ppm = umole/mole

v = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report No. MMAP 232.09/202491.

Analyst:

*Steve Kozy*

S.B. Kozy

Approved:

*J.T. Marrin*

J.T. Marrin

